2005 Beltwide Cotton Conferences, New Orleans, Louisiana - January 4 - 7, 2005

FIELD WEATHERING EFFECTS ON SELECTED COTTON FIBER QUALITY PARAMETERS IN THE TEXAS HIGH PLAINS

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Abstract

The objectives of this study were to document the effects of harvest timing (with and without harvest-aid crop termination) on field-weathering losses, cotton fiber and seed quality, and yield, and to document losses associated with harvesting (with and without bur extracting), and subsequent ginning losses, textile concerns, and overall economics.

Introduction

Previous data from small plot weathering studies are inadequate to describe exposure losses in the Texas High Plains. Scientists need large plot data and large amounts of fiber to adequately describe losses from exposure. Therefore, a comprehensive large plot study was conducted from 2000 to 2002 in order determine the overall effects of field weathering of stripper harvested cotton in the Texas High Plains. Results from the 2001 and 2002 crop years will be discussed in this paper.

Materials and Methods

A randomized complete block design with three replications with a split-plot arrangement of treatments was utilized. Main plot treatments of harvest date were randomly assigned to eight 40-inch rows with variable length (pivot rows). Subplot treatments (harvested with and without field cleaner) were randomly assigned to four 40-inch rows within each main plot. Subplot size was approximately 0.5 acres in order to obtain 300 to 400 pounds of lint required to perform the detailed analyses. Analysis of data was performed using SAS version 8 for Windows using the general linear models procedure for the split-plot design. Mean separation was performed using least significant difference. The plots were seeded to 'Paymaster 2326RR', a widely planted storm-proof High Plains cultivar on May 15th and 8th for 2001 and 2002, respectively. The field was irrigated with a low energy precision application (LEPA) center pivot. Harvest-aid treatments were applied to the eight row main plots using a Lee Spider equipped with 8002 nozzles on 20" spacing set to deliver 15 gallons/acre spray solution. Harvest-aid treatments consisted of a tank mix of ethephon/defoliant followed by a terminating application of paraquat. Each year, an "early" harvest-aid treatment was applied to one main plot at 50% open bolls (September 19 and September 25 for 2001 and 2002, respectively). Subsequently, a "normal" 70% open boll stage, harvest-aid treatment, was applied to the remaining main plots on September 26 in 2001 and October 10 in 2002. Sub-plots were harvested with a John Deere 7455 stripper equipped with a field cleaner. Harvest dates for the 2001 crop year were October 4 for the "early" termination and November 6, November 26, December 7, December 19 and January 7 (2002) for the "normal" termination plots. For the 2002 crop year, the "early" termination plot was harvested on October 20th, and the "normal" termination plots were harvested on November 18, December 16, January 3 (2003), and January 17 (2003). Accumulated, post-harvest-aid, precipitation amounts, in inches, for each respective harvest date in 2001 were, in chronological order, 0.86, 1.01, 3.60, 3.60, 3.62, and 3.67; and in 2002 were 2.08, 7.07, 8.49, 8.65, and 8.75. Harvested material from each sub-plot was transferred to cotton trailers and subsequently weighed and ginned at the Lubbock USDA-ARS Cotton Production and Processing Research Unit. Lint samples from each sub-plot were submitted to the Texas Tech University International Textile Center at Lubbock for fiber, yarn and fabric analyses.

Results

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Results of fiber quality analysis using high volume instrument (HVI) (micronaire, length, strength and uniformity) and advanced fiber information system (AFIS) (nep count, short fiber content, and maturity ratio) were presented. Additionally, yarn analyses of coefficient of variation by mass (CVm), number of thin and thick places/km, yarn nep count, tenacity, and elongation for 22Ne ring spun yarn as well as white speck counts for finished fabric were discussed. The HVI results for micronaire indicated a slight reduction with later harvest dates only in 2002. Slight significant increases in micronaire were observed in both years when the field cleaner was utilized. Length and strength were significantly reduced with later harvest dates in 2001. A small reduction in uniformity for later harvest dates was observed in 2001. In 2001, later harvest dates increased short fiber content and field cleaning reduced the number of neps per gram and short fiber content, whereas an increase in maturity ratio was observed. A reduction in neps per gram was noted with field cleaning in 2002. Results from the 22Ne ring spun yarn analyses indicated significant increases in yarn CVm and number of thick places with later harvest dates for both years. Increases in the number of thin places and the number of neps were observed with later harvest dates in 2001. Decreases in tenacity with later harvest dates were observed in both years and elongation values tended to decrease with later harvest dates only in 2001. In 2001, field cleaning reduced the number of thin places. No other differences in yarn quality were observed for field cleaning. Fabric analysis of white speck counts indicated a significant increase with later harvest dates in both years and field cleaning had no effect. Results from these data indicate that delayed harvest timing can result in decreased fiber and yarn quality and increased white specks in finished fabric and that field cleaning may help reduce the impact of decreased quality due to weathering as compared to non-field cleaned cotton.